

WHAT IS CLAIMED IS:

1. An image processing apparatus comprising:
  - an input unit that inputs color image signals;
  - a first segmentation unit that determines attributes of a target
  - 5 pixel for the color image signals;
  - a color component control unit that conducts a predetermined processing to color components of the target pixel based on the attributes of the target pixels determined to thereby generate processed color image signals;
  - 10 a second segmentation unit that determines attributes of the target pixel for the processed color image signals; and
  - an image processing unit that conducts an image processing to the processed color image signals based on the attributes of the target pixel determined by the second segmentation unit.
  - 15
2. The image processing apparatus according to claim 1, wherein
  - the first segmentation unit determines whether the target pixel is any one of a black character pixel and a non-black character pixel based on the attributes of the target pixel,
  - 20 the color component control section increases the color components of the target pixel upon the first segmentation unit determining that the target pixel is the non-black character pixel,
  - the second segmentation unit detects a black character pixel by analyzing at least color components of the processed color image
  - 25 signals, and

the image processing unit conducts the image processing to the processed color image signals based on the black character pixel detected.

- 5     3.     The image processing apparatus according to claim 2, wherein  
the color component control unit performs an achromatic color  
pixel generation processing for any one of reducing and removing the  
color components of the target pixel that is determined by the first  
segmentation unit to be the black character pixel.

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4.     The image processing apparatus according to claim 1, wherein  
the first segmentation unit determines whether the target pixel is  
any one of a colored character pixel and a non-colored character pixel  
based on the attributes of the target pixel,

- 15     the color component control section increases the color  
components of the target pixel upon the first segmentation unit  
determining that the target pixel is the non-colored character pixel,

- the second segmentation unit detects a colored character pixel  
by analyzing at least color components of the processed color image  
20     signals, and

the image processing unit conducts the image processing to the  
processed color image signals based on the colored character pixel  
detected.

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5. The image processing apparatus according to claim 1, wherein  
the first segmentation unit determines whether the target pixel is  
any one of a character pixel and a non-character pixel based on the  
attributes of the target pixel,

5 the color component control section increases the color  
components of the target pixel upon the first segmentation unit  
determining that the target pixel is the non-character pixel,

the second segmentation unit detects a character pixel by  
analyzing at least color components of the processed color image

10 signals, and

the image processing unit conducts the image processing to the  
processed color image signals based on the character pixel detected.

6. The image processing apparatus according to claim 1, further  
15 comprising a storage unit that stores the processed color image signals,  
wherein

the second segmentation unit determines the attributes of the  
target pixel based on the processed color image signals stored in the  
storage unit.

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7. The image processing apparatus according to claim 1, further  
comprising:

a compression unit that compresses the processed color image  
signals to thereby generate compressed processed color image signals;

25 a storage unit that stores the compressed processed color

image signals; and

an expansion unit that expands the compressed processed color image signals stored in the storage unit to thereby generate expanded processed color image signals, wherein

5           the second segmentation unit determines the attributes of the target pixel based on the expanded processed color image signals stored in the storage unit.

8.       The image processing apparatus according to claim 7, wherein  
10       the compression unit conducts a nonreversible compression processing to the processed color image signals.

9.       The image processing apparatus according to claim 7, wherein  
15       the compression unit converts the processed color image signals to luminance and color difference signals and then compresses the processed color image signals.

10.      The image processing apparatus according to claim 2, wherein  
20       the color component control unit increases the color components upon the color components of the target pixel, attributes of which are determined, being smaller than a predetermined value.

11.      The image processing apparatus according to claim 2, wherein  
25       the color component control unit increases the color components for an image area in which a probability of erroneously

detecting the non-black character pixel as the black character pixel is high when the second segmentation unit detects the black character pixel than other areas or for increasing the color components only of the image area in which the probability of erroneously detecting the non-black character pixel as the black character pixel is high.

12. The image processing apparatus according to claim 1, wherein the first segmentation unit determines any one of a black character pixel on a white background area and a black line pixel on a white background area as a black character pixel, and the second segmentation unit determines a pixel, which is in an area adjacent to a white pixel area and which is substantially an achromatic color pixel, as a black character pixel.

13. The image processing apparatus according to claim 1, further comprising:  
a conversion and transfer unit that  
converts the processed color image signals into image signals in a predetermined image format that is designated by one of a system and a user,  
transfers the image signals in the predetermined image format to an external device, and  
controls the color component control unit according to the predetermined image format.

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14. The image processing apparatus according to claim 13, wherein  
the conversion and transfer unit controls an area of the black  
character pixel determined by the first segmentation unit to be  
expanded, as the area subjected to an achromatic color pixel  
5 generation processing, to a surrounding area as control over the color  
component control unit according to the predetermined image format.

15. The image processing apparatus according to claim 6, further  
comprising:  
10 a conversion and transfer unit that converts the processed color  
image signals stored in the storage unit to image signals in a  
predetermined image format designated by one of a system and a user,  
and transfers the image signals in the predetermined image format to  
an external device, wherein  
15 the conversion and transfer unit comprises a second color  
component control unit that conducts one of or both of a chromatic color  
pixel generation processing and an achromatic color pixel generation  
processing to the processed color image signals stored in the storage  
unit according to information on the attributes determined from the  
20 image signals stored in the storage unit, and  
the second color component control unit conducts one of or both  
of the chromatic color pixel generation processing and the achromatic  
color pixel generation processing again to the processed color image  
signals stored in the storage unit according to the information on the  
25 attributes determined from the processed color image signals stored in

the storage unit, and transfers the resultant image signals to the external device.

16. The image processing apparatus according to claim 15, wherein  
5 the second color component control unit conducts one of or both of the chromatic color pixel generation processing and the achromatic color pixel generation processing again to the processed color image signals stored in the storage unit according to the attributes of the target pixel determined by the first segmentation unit, and  
10 the conversion and transfer unit transfers the image signals obtained due to the processing by the second color component control unit to the external device.

17. The image processing apparatus according to claim 15, wherein  
15 the conversion and transfer unit stores a content of the processing conducted to the image signals in header information and transfers the header information to the external device when transferring the image signals to the external device.

20 18. The image processing apparatus according to claim 15, further comprising an input unit that inputs image signals from the external device, wherein

the second segmentation unit determines attributes of the image signals input from the external device, and  
25 the conversion and transfer unit controls a black character

extraction method executed by the second segmentation unit according to the header information attached to the image signals.

19. The image processing apparatus according to claim 15, wherein  
5 the storage unit stores image data input from the external device, and

if the second segmentation unit reads the image signals stored in the storage unit, detects the attributes of the target pixel, and determines that header information indicating a content of the  
10 processing is not attached to the image signals, the conversion and transfer unit controls the second segmentation unit to restrict black character extraction or not to conduct the black character extraction.

20. An image processing apparatus comprising:  
15 an input unit that inputs color image signals; and  
a magnification unit that magnifies the color image signals input in such a manner that predetermined color information included in the color image signals before magnifying the color image signals are retained even after magnifying the color image signals.

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21. The image processing apparatus according to claim 20, wherein the predetermined color information includes a ratio of a plurality of color component signals.

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22. The image processing apparatus according to claim 21, wherein the magnification unit includes

a first magnification unit that magnifies at least one component signal of the color image signals represented by the plurality of color component signals; and

a second magnification unit that magnifies at least one component signal, other than that has been magnified by the first magnification unit, of the color image signals while referring to the color image signals that is magnified and that is not magnified by the first magnification unit.

23. The image processing apparatus according to claim 20, wherein the predetermined color information includes at least color difference information.

24. The image processing apparatus according to claim 23, wherein the color image signals includes a luminance signal and a color difference signal, and the magnification unit includes

a luminance signal magnification unit that magnifies the luminance signal; and

a color difference signal magnification unit magnifies the color difference signals in a manner that is different from magnification of the luminance signal magnification unit by the luminance signal.

25. The image processing apparatus according to claim 24, wherein  
the color difference signal magnification unit performs  
magnification in such a manner that a reference pixel area becomes  
narrower as compared with a reference pixel area that is obtained when  
5 the luminance signal magnification unit performs the magnification.

26. The image processing apparatus according to claim 24, wherein  
the luminance signal magnification unit and the color difference signal  
magnification unit magnify corresponding signals by giving weight  
10 parameters to peripheral pixels, and  
the weight parameter set by the luminance signal magnification  
unit are different from that set by the color difference signal  
magnification unit.

15 27. The image processing apparatus according to claim 20, wherein  
the magnification unit conducts different two-dimensional  
magnification setting processings in a longitudinal direction and a  
lateral direction of an image, respectively.

20 28. An image processing apparatus comprising:  
an input unit that inputs color image signals in which code  
information representing a feature of an image is buried;  
a magnification unit that magnifies the color image signals input  
in such a manner that the code information buried in the color image  
25 signals before magnifying the color image signals are retained even

after magnifying the color image signals; and

an image processing unit that conducts an image processing to the color image signals magnified.

5     29.     The image processing apparatus according to claim 28, wherein  
the code information includes a predetermined color component  
in the color image signals.

30.     The image processing apparatus according to claim 28, wherein  
10         the code information is allocated at least one signal of a plurality  
of color components in the color image signals as a code signal  
representing a feature of an image and buried in the at least one signal.

31.     The image processing apparatus according to claim 28, further  
15     comprising a code information recognition unit that recognizes the code  
information buried in the color image signals input, wherein  
the magnification unit magnifies the color image signals  
according to the code information recognized.

20     32.     The image processing apparatus according to claim 28, further  
comprising:

a segmentation unit that determines an area having a  
predetermined feature in the color image signals input; and

a code burying unit that buries the code information in the area  
25     determined to have the predetermined feature of the color image

signals input.

33. The image processing apparatus according to claim 28, wherein the magnification unit includes

5 a first selective processing unit that processes a pixel, in the color image signals, that has the code information buried, in such a manner that the code information is retained even after magnifying the color image signals; and

a second selective processing unit that processes a pixel, in the  
10 color image signals, that has no code information buried, in such a manner that the pixel in question is not converted to a pixel having the code information after magnifying the color image signals.

34. An image processing system comprising:

15 an input unit that inputs color image signals;

a first segmentation unit that determines attributes of a target pixel for the color image signals;

a color component control unit that conducts a predetermined processing to color components of the target pixel based on the  
20 attributes of the target pixels determined to thereby generate processed color image signals;

a second segmentation unit that determines attributes of the target pixel for the processed color image signals; and

an image processing unit that conducts an image processing to  
25 the processed color image signals based on the attributes of the target

pixel determined by the second segmentation unit.

35. The image processing system according to claim 34, wherein  
the first segmentation unit determines whether the target pixel is  
5 any one of a black character pixel and a non-black character pixel  
based on the attributes of the target pixel,

the color component control section increases the color  
components of the target pixel upon the first segmentation unit  
determining that the target pixel is the non-black character pixel,

10 the second segmentation unit detects a black character pixel by  
analyzing at least color components of the processed color image  
signals, and

the image processing unit conducts the image processing to the  
processed color image signals based on the black character pixel

15 detected.

36. The image processing system according to claim 35, wherein  
the color component control unit performs an achromatic color  
pixel generation processing for any one of reducing and removing the  
20 color components of the target pixel that is determined by the first  
segmentation unit to be the black character pixel.

37. The image processing system according to claim 34, wherein  
the first segmentation unit determines whether the target pixel is  
25 any one of a colored character pixel and a non-colored character pixel

based on the attributes of the target pixel,

the color component control section increases the color components of the target pixel upon the first segmentation unit determining that the target pixel is the non-colored character pixel,

5 the second segmentation unit detects a colored character pixel by analyzing at least color components of the processed color image signals, and

the image processing unit conducts the image processing to the processed color image signals based on the colored character pixel

10 detected.

38. The image processing system according to claim 34, wherein

the first segmentation unit determines whether the target pixel is any one of a character pixel and a non-character pixel based on the

15 attributes of the target pixel,

the color component control section increases the color components of the target pixel upon the first segmentation unit determining that the target pixel is the non-character pixel,

the second segmentation unit detects a character pixel by  
20 analyzing at least color components of the processed color image signals, and

the image processing unit conducts the image processing to the processed color image signals based on the character pixel detected.

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39. The image processing system according to claim 34, further comprising a storage unit that stores the processed color image signals, wherein

the second segmentation unit determines the attributes of the target pixel based on the processed color image signals stored in the storage unit.

40. The image processing system according to claim 34, further comprising:

a compression unit that compresses the processed color image signals to thereby generate compressed processed color image signals;

a storage unit that stores the compressed processed color image signals; and

an expansion unit that expands the compressed processed color image signals stored in the storage unit to thereby generate expanded processed color image signals, wherein

the second segmentation unit determines the attributes of the target pixel based on the expanded processed color image signals stored in the storage unit.

41. The image processing system according to claim 40, wherein the compression unit conducts a nonreversible compression processing to the processed color image signals.

42. The image processing system according to claim 40, wherein the compression unit converts the processed color image signals to luminance and color difference signals and then compresses the processed color image signals.

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43. The image processing system according to claim 35, wherein the color component control unit increases the color components upon the color components of the target pixel, attributes of which are determined, being smaller than a predetermined value.

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44. The image processing system according to claim 35, wherein the color component control unit increases the color components for an image area in which a probability of erroneously detecting the non-black character pixel as the black character pixel is high when the second segmentation unit detects the black character pixel than other areas or for increasing the color components only of the image area in which the probability of erroneously detecting the non-black character pixel as the black character pixel is high.

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45. The image processing system according to claim 34, further comprising:

a conversion and transfer unit that

converts the processed color image signals into image signals in a predetermined image format that is designated by one of a system and a user,

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transfers the image signals in the predetermined image format to an external device, and

controls the color component control unit according to the predetermined image format.

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46. The image processing system according to claim 39, further comprising:

a conversion and transfer unit that converts the processed color image signals stored in the storage unit to image signals in a predetermined image format designated by one of a system and a user, and transfers the image signals in the predetermined image format to an external device, wherein

the conversion and transfer unit comprises a second color component control unit that conducts one of or both of a chromatic color pixel generation processing and an achromatic color pixel generation processing to the processed color image signals stored in the storage unit according to information on the attributes determined from the image signals stored in the storage unit, and

the second color component control unit conducts one of or both of the chromatic color pixel generation processing and the achromatic color pixel generation processing again to the processed color image signals stored in the storage unit according to the information on the attributes determined from the processed color image signals stored in the storage unit, and transfers the resultant image signals to the external device.

47. An image processing method comprising:  
inputting color image signals;  
determining attributes of a target pixel for the color image  
5 signals;  
conducting a predetermined processing to color components of  
the target pixel based on the attributes of the target pixels determined  
to thereby generate processed color image signals;  
determining attributes of the target pixel for the processed color  
10 image signals; and  
conducting an image processing to the processed color image  
signals based on the attributes of the target pixel determined for the  
processed color image signals.
- 15 48. The image processing method according to claim 47, wherein  
the determining attributes of a target pixel for the color image  
signals includes determining whether the target pixel is any one of a  
black character pixel and a non-black character pixel based on the  
attributes of the target pixel,  
20 the predetermined processing includes increasing the color  
components of the target pixel upon it is determined at the determining  
attributes of a target pixel for the color image signals that the target  
pixel is the non-black character pixel,  
the determining attributes of the target pixel for the processed  
25 color image signals includes detecting a black character pixel by

analyzing at least color components of the processed color image signals, and

the conducting the image processing includes processing the processed color image signals based on the black character pixel  
5 detected.

49. The image processing apparatus according to claim 48, wherein  
the conducting the predetermined processing includes  
performing an achromatic color pixel generation processing for any one  
10 of reducing and removing the color components of the target pixel that  
is determined at the determining attributes of a target pixel for the color  
image signals to be the black character pixel.

50. The image processing method according to claim 47, wherein  
15 the determining attributes of a target pixel for the color image  
signals includes determining whether the target pixel is any one of a  
colored character pixel and a non-colored character pixel based on the  
attributes of the target pixel,

the predetermined processing includes increasing the color  
20 components of the target pixel upon it is determined at the determining  
attributes of a target pixel for the color image signals that the target  
pixel is the non-colored character pixel,

the determining attributes of the target pixel for the processed  
color image signals includes detecting a colored character pixel by  
25 analyzing at least color components of the processed color image

signals, and

the conducting the image processing includes processing the processed color image signals based on the colored character pixel detected.

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51. The image processing method according to claim 47, wherein the determining attributes of a target pixel for the color image signals includes determining whether the target pixel is any one of a character pixel and a non-character pixel based on the attributes of the target pixel,

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the predetermined processing includes increasing the color components of the target pixel upon it is determined at the determining attributes of a target pixel for the color image signals that the target pixel is the non-character pixel,

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the determining attributes of the target pixel for the processed color image signals includes detecting a character pixel by analyzing at least color components of the processed color image signals, and

the conducting the image processing includes processing the processed color image signals based on the character pixel detected.

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52. An image processing method comprising:

inputting color image signals; and

magnifying the color image signals input in such a manner that predetermined color information included in the color image signals

25 before magnifying the color image signals are retained even after

magnifying the color image signals.

53. The image processing method according to claim 52, wherein  
the predetermined color information includes a ratio of a plurality  
5 of color component signals.

54. The image processing method according to claim 53, wherein  
the magnifying includes  
first magnifying at least one component signal of the color image  
10 signals represented by the plurality of color component signals; and  
second magnifying at least one component signal, other than  
that has been magnified at the first magnifying, of the color image  
signals while referring to the color image signals that is magnified and  
that is not magnified at the first magnifying.

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55. The image processing method according to claim 52, wherein  
the predetermined color information includes at least color  
difference information.

20 56. The image processing method according to claim 55, wherein  
the color image signals includes a luminance signal and a color  
difference signal, and the magnifying includes  
magnifying the luminance signal; and  
magnifying the color difference signals in a manner that is  
25 different from magnifying the luminance signal.

57. The image processing method according to claim 56, wherein  
the magnifying the color difference signals includes magnifying  
in such a manner that a reference pixel area becomes narrower as  
5 compared with a reference pixel area that is obtained when magnifying  
the luminance signal.

58. The image processing method according to claim 56, wherein  
the luminance signal and the color difference signal are magnified by  
10 giving weight parameters to peripheral pixels, and  
the weight parameter for the luminance signal are different from  
that for the color difference signal.

59. The image processing method according to claim 52, wherein  
15 the magnifying includes magnifying in two different directions of  
an image.

60. An image processing method comprising:  
inputting color image signals in which code information  
20 representing a feature of an image is buried;  
magnifying the color image signals input in such a manner that  
the code information buried in the color image signals before  
magnifying the color image signals are retained even after magnifying  
the color image signals; and  
25 conducting an image processing to the color image signals

magnified.

61. The image processing method according to claim 60, wherein  
the code information includes a predetermined color component  
5 in the color image signals.

62. The image processing method according to claim 60, wherein  
the code information is allocated at least one signal of a plurality  
of color components in the color image signals as a code signal  
10 representing a feature of an image and buried in the at least one signal.

63. The image processing method according to claim 60, further  
comprising recognizing the code information buried in the color image  
signals input, wherein  
15 the magnifying includes magnifying the color image signals  
according to the code information recognized.

64. The image processing method according to claim 60, further  
comprising:  
20 determining an area having a predetermined feature in the color  
image signals input; and  
burying the code information in the area determined to have the  
predetermined feature of the color image signals input.

65. The image processing method according to claim 60, wherein the magnifying includes

processing a pixel, in the color image signals, that has the code information buried, in such a manner that the code information is

5 retained even after magnifying the color image signals; and

processing a pixel, in the color image signals, that has no code information buried, in such a manner that the pixel in question is not converted to a pixel having the code information after magnifying the color image signals.

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